Alg. 2 Warm Up #11-1

Solve by completing the square
(answer exact and simplified)

1. $3x^2 - 6x + 2 = 0$

Solve by factoring

2. $4x^2 - 23x - 6 = 0$

3. $4x^2 + 11x + 6 = 0$

HW Questions: Green WS

7) $2m^2 - 7m - 3 = 0$

$a = 2$
$b = -7$
$c = -3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{7 \pm \sqrt{49 - 4(2)(-3)}}{2(2)}$$

$49 + 24$

$$x = \frac{7 \pm \sqrt{73}}{4}$$

10) $9x^2 - 9x - 7 = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

$a = 9$
$b = -9$
$c = -7$

$$x = \frac{9 \pm \sqrt{81 - 4(9)(-7)}}{2(9)} \qquad 81 + 252$$

$$x = \frac{9 \pm \sqrt{333}}{18}$$

$$\frac{9 \pm \sqrt{9}\sqrt{37}}{18}$$

$$\frac{9}{18} \pm \frac{3\sqrt{37}}{18}$$

$$\boxed{\frac{1}{2} \pm \frac{\sqrt{37}}{6}}$$

15) $4\log_5(x+1) = 4.8$

$$\log_5(x+1)^4 = 4.8$$

$$\sqrt[4]{5^{4.8}} = \sqrt[4]{(x+1)^4}$$

$$(5^{4.8})^{1/4} = x + 1$$

$$5^{1.2} = x + 1$$

$$x = 5^{1.2} - 1$$

$$x \approx 5.89$$

16 $\log 5^{(x+2)} = \log 4$

$\frac{(x+2)\log 5}{\log 5} = \frac{\log 4}{\log 5}$

$x + 2 = \frac{\log 4}{\log 5}$

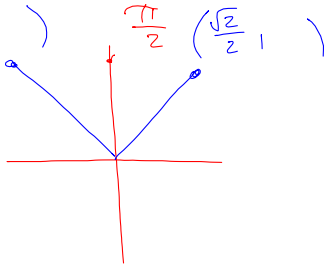
$x = -2 + \frac{\log 4}{\log 5}$

17) $\frac{4\sin\theta}{4} = \frac{4}{4}$ for $0 < \theta < 2\pi$

$\sin\theta = 1$

$\theta = \sin^{-1}(1)$

$\theta = \frac{\pi}{2}$



18) $\frac{2\cos^2\theta}{2} = \frac{1}{2}$

$\sqrt{(\cos\theta)^2} = \sqrt{\frac{1}{2}\cdot\frac{\sqrt{2}}{\sqrt{2}}}$

$\cos\theta = \pm\frac{\sqrt{2}}{2}$

$\theta = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

Chapter 8 Polynomials

In this chapter you will expand your knowledge of families of functions to include polynomial functions. As you investigate the equation ↔ graph connection for polynomials, you will learn how to search for factors (which can help you find x-intercepts) and how to use division to find additional factors.

When you investigate the graphs of polynomials and systems involving polynomials, you will see many that appear not to intersect. As you investigate these systems further, you will learn about imaginary and complex numbers.

In the last section of the chapter, you will apply your knowledge of polynomials to model some of the attractions at a county fair.

Guiding Question

Mathematically proficient students reason abstractly and quantitatively.

As you work through this chapter, ask yourself:

How can the degree of a polynomial help me determine the nature of its graph or a possible equation?

Chapter Outline

Section 8.1 You will investigate polynomial functions and learn how to sketch graphs of them without using a graphing calculator. You will also learn how to find polynomial equations from their graphs.

Section 8.2 Here you will solve equations you could not solve earlier by expanding the set of numbers you use. You will be introduced to a number system called *complex numbers*. You will learn what imaginary and complex numbers are, their properties, and how they are used to represent solutions when graphs do not intersect.

Section 8.3 In this section, you will learn how to divide polynomials by applying your knowledge of area models and factoring. You will solve equations using polynomial division to factor polynomials.

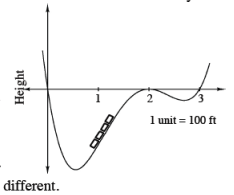
8.1.1 How can I describe the graph?

Sketching Graphs of Polynomial Functions

In previous courses and chapters, you learned how to graph many types of functions, including lines and parabolas. Today you will work with your team to apply what you know to more complicated **polynomial** equations. Just as quadratic polynomial equations can be written in standard or factored form, other polynomial equations can be written in standard or factored form. For example, $y = x^4 - 4x^3 - 3x^2 + 10x + 8$ is in standard form, but it can be written in factored form as $y = (x+1)^2(x-2)(x-4)$.

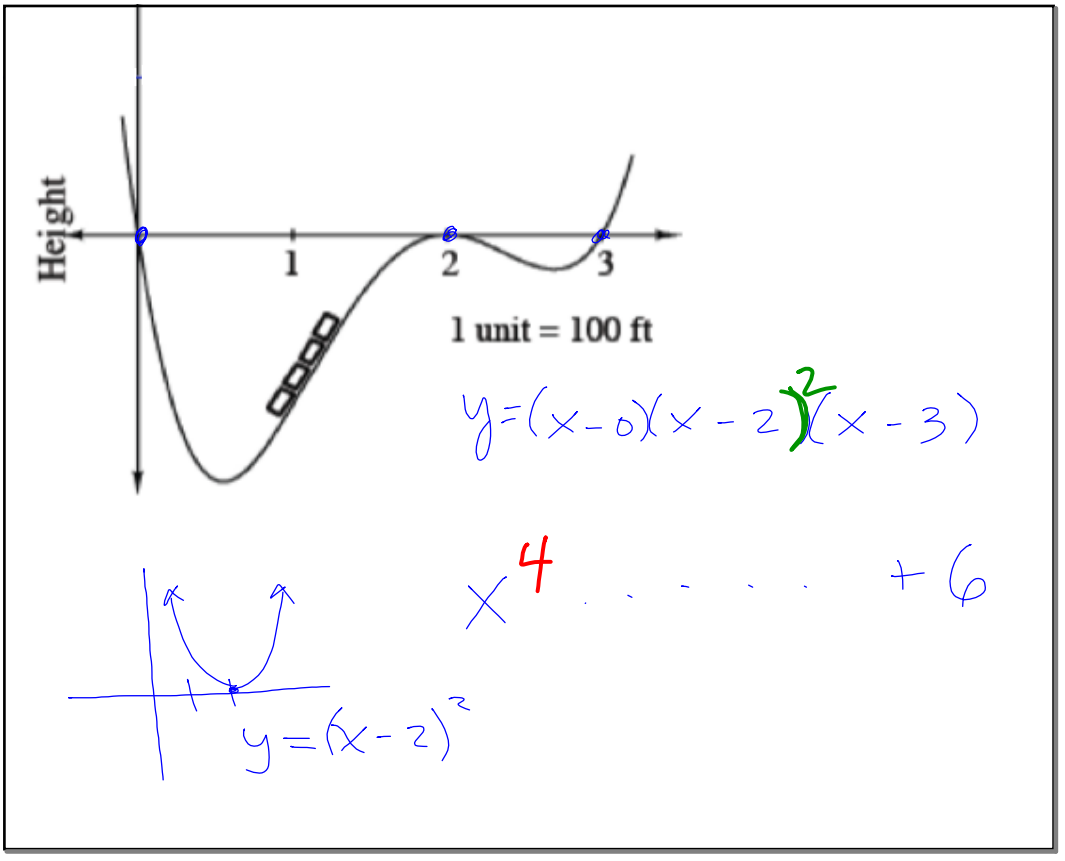
During this lesson, you will develop techniques for sketching the graph of a polynomial function from its equation, and you will justify why those techniques work.

8-1. The Mathamericaland Carnival Company has decided to build a new roller coaster to use at this year's county fair. The new coaster will have a very special feature: part of the ride will be underground. The designers will use polynomial functions to describe different pieces of the track. Part of the design is shown at right. Your task is to guess a possible equation to represent the track and test it on your graphing calculator. To help get an idea of what to try, start by checking the graphs of the equations given below. Think about how the graphs are the same and how they are different.



$$y = x(x-2)$$
$$y = (x-2)^2$$
$$y = x(x-2)(x-3)$$

Your Task: Use the information you found by graphing the above equations to help you make guesses about the equation that would produce the graph of the roller coaster. Once you have found a graph that has a shape close to this one, try zooming in or changing the viewing window on your graphing calculator to see the details better. Keep track of what you tried and the equations you find that fit most accurately.



8-2. POLYNOMIAL FUNCTION INVESTIGATION p. 372

In this investigation, you will determine which information in a polynomial equation can help you sketch its graph.

Your Task: With your team, create summary statements explaining the relationship between a polynomial equation and its graph. To accomplish this task, first divide up the equations listed below so each team member is responsible for two or three of them. Make a complete graph of each of your functions. Whenever possible, start by making a sketch of your graph without using your graphing calculator. Then, as a team, share your observations including your responses to the Discussion Points. Choose two or three equations that can be used to represent all of your findings. You can choose them from the list below, or you can create new ones as a team.

The form of your presentation to the class can be on a poster, a display to be projected onto the board or as a PowerPoint™ presentation. Whichever format your teacher decides, make sure you include complete graphs and summary statements that are well justified.

$P_1(x) = (x-2)(x+5)^2$

$P_2(x) = 2(x-2)(x+2)(x-3)$

$P_3(x) = x^4 - 21x^2 + 20x$

$P_4(x) = (x+3)^2(x+1)(x-1)(x-5)$

$P_5(x) = -0.1x(x+4)^3$

$P_6(x) = x^4 - 9x^2$

$P_7(x) = 0.2x(x+1)(x-3)(x+4)$

$P_8(x) = x^4 - 4x^3 - 3x^2 + 10x + 8$

Discussion Points

What can we predict from looking at the equation of a polynomial? Why does this make sense?

Which form of a polynomial equation is most useful for making a graph? What information does it give?

How can we use the equation to help predict what a useful window might be?

Which examples are most helpful in finding the connections between the equation and the graph?

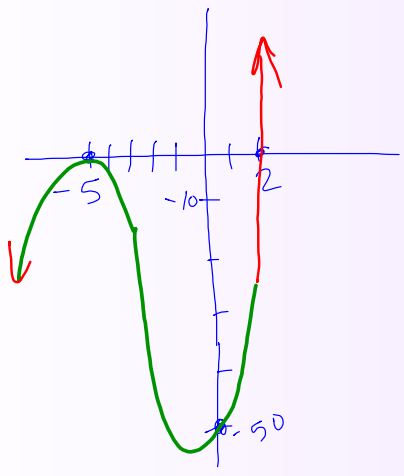
How does changing the exponent on one of the factors change the graph?

CP's: 8- # 3 ---> 6 (purple WS)

8-3. As a team, examine the first polynomial $P_1(x) = (x-2)(x+5)^2$.

a. To which family of functions does it belong? How do you know? Based on its equation, sketch the shape of its graph.

b. Now use your graphing calculator to graph $P_1(x)$. Label the x-intercepts. How are the x-intercepts related to the equation? "Reading" from left to right along the x-axis, describe the graph before the first x-intercept, between x-intercepts, and after the last x-intercept.



y-int: (0, -50)

8-4. Continuing your work as a team, examine the equation $P_2(x) = 2(x-2)(x+2)(x-3)$.

a. How many distinct (different) factors are there? How many x-intercepts would you predict it would have on its graph? Draw the graph and label the x-intercepts. How is this graph similar to or different from the graph of $P_1(x)$?

b. Does the factor 2 have any effect on the x-intercepts? On the shape of the graph? On the y-intercepts? How would the graph change if the factor 2 were changed to be a factor –2?

8-5. What is different about $P_3(x) = x^4 - 21x^2 + 20x$? What x-intercept(s) can you determine from the equation, before graphing with the calculator? Explain how you know. Use the graph to figure out exactly what the other intercepts are. Explain how you can prove that your answers are exact.

8-6. With your team, divide up the work to investigate $P_4(x)$ through $P_8(x)$ and continue your investigation, referring back to the "Your Task" statement and the discussion points in problem 8-2.

Further Guidance section ends here.

HW: 8 -

8, 9, 11, 12, 16 - 19